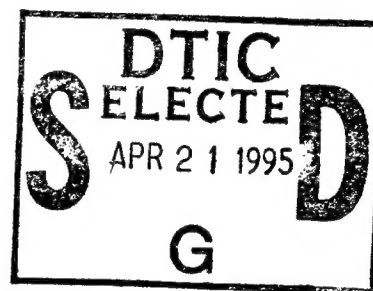
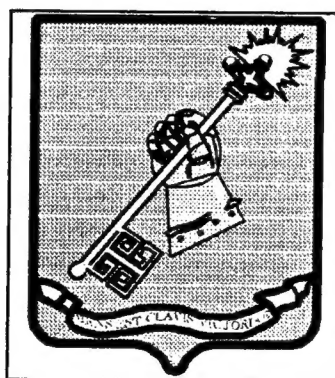


LOGISTICAL SUPPORT FOR DIVISION-SIZED DEEP MANEUVER FORCES

IS IT FEASIBLE?

**A Monograph
by**

**Major Darrell K. Williams
Quartermaster**



**School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas**

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Major Darrell K. Williams

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Approved by:



James J. Schneider, Ph.D.

Monograph Director



COL Gregory Fontenot, MA, MMAS

Director, School of
Advanced Military
Studies



Philip J. Brookes, Ph.D.

Director, Graduate
Degree Program

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ABSTRACT

LOGISTICAL SUPPORT FOR A DIVISION-SIZED DEEP MANEUVER FORCE: IS IT FEASIBLE?

This monograph examines the feasibility of logistically supporting a heavy division-sized force conducting deep maneuver. Historically, deep maneuver forces have performed such missions as raids to cut enemy supply lines and command and control facilities, exploitations, pursuits, and attacks against enemy operational reserves. The Achilles heal, however, has often been the inability of deep maneuver forces to sustain themselves. A recent concept, called digitization of the battlefield, offers promise in addressing some of the sustainment challenges. This monograph examines the support requirements for such a force and how deep forces may benefit from the use of digital technology and other logistically enhancing tools.

First, the monograph discusses the origins of deep maneuver. Its origins are traced back to the former Soviet Operational Maneuver Groups (OMGs) of the recent past, and Soviet Mobile Groups from World War II. Second, it examines the concept of employment for deep maneuver forces. As a basis for discussion, it uses the Mobile Strike Force (MSF). The MSF is a US Army conceptual, fully-digitized, heavy division technologies and systems projected to be available at or near the beginning of the 21st Century. It also examines similarities and differences between the MSF and OMG concepts of employment. Third, it studies the logistical challenges and concerns related to the deep maneuver concept. Finally, it examines the logistical requirements of deep maneuver divisions.

The monograph concludes that logistical support is feasible, but only under certain conditions. First, deep maneuver divisions should be ordinary rather than an extraordinary forces. Second, these forces should embrace digital technology. Third, they must be given missions commensurate with their logistical capabilities. Fourth, they must have a single logistics commander to ensure an integrated logistics effort.

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I. Introduction

The first essential condition for an army to be able to stand the strain of battle is an adequate stock of weapons, petrol and ammunition. In fact, the battle is fought and decided by the quartermasters before shooting begins. The bravest men can do nothing without guns, the guns nothing without plenty of ammunition; and neither guns nor ammunition are of much use in mobile warfare unless there are vehicles with sufficient petrol to haul them around. Maintenance must also approximate in quantity and quality to that available to the enemy.¹

This quote by General Rommel underscores the importance of logistics in war and its potential impact on the outcome of battle. Logistics is defined as "the process of planning and executing the movement and sustainment of forces in the execution of military operations."² When logistics is well planned and executed, it becomes a combat multiplier. Conversely, history has shown that poor logistics planning and execution has often led to defeat.

From a theoretical perspective, both Clausewitz and Jomini addressed the importance of logistics. Jomini defined logistics as the practical art of moving armies.³ Further, he understood the important place of supply in the scheme of mobile warfare.⁴ Jomini also wrote extensively on the significance of secured lines of communication and bases of operation, recognizing them as limiting factors in both strategical and tactical operations. He viewed logistics as fundamentally essential to the conduct of large-scale military operations, intimately woven into the fabric of war. All of his writings indicated that he was definitely "supply conscious."⁵

Clausewitz, on other hand, attempted to separate supply from the business of war.⁶ Nonetheless, he was likewise "supply conscious." Clausewitz addressed logistics in terms of billets, maintenance and supply, base of operations, and lines of supply. Regarding

supply, he wrote that, "For two reasons the problem of supply has assumed much greater importance in modern warfare. First, armies are much larger than those of the Middle Ages, or even those of the *ancien regime*. Second, a war tends to be more of one piece, and fighting forces are in constant readiness for action."⁷

The criticality of the logistic function and its potential impact on the outcome of battle has not diminished since the writings of Clausewitz and Jomini, nor since Rommel's North African campaign during World War II. In fact, the complexity and scale of logistic operations continues to soar. The modern US Army heavy division, for example, consumes as much as a World War II field army. During Operation Desert Shield, the defensive phase of the Gulf War, each division required 345,000 gallons of diesel fuel, 50,000 gallons of aviation fuel, 213,000 gallons of water, and 208 40-foot trailers of other supplies each day, ranging from barrier material to ammunition.⁸ The requirements increased dramatically during Desert Storm, the (ground) offensive phase of the war. A single division consumed 2.4 million gallons of fuel during the 100-hour offensive.⁹ The magnitude of the Desert Shield/Storm operations severely stretched logistics assets, and threatened the logistic system's capability to sustain further operations.

With an eye towards the future, evolving US Army doctrine promises to create even greater challenges in the sustainment of mobile forces. One initiative involves support for *deep maneuver forces*. In May of 1994, the Command and General Staff College, Fort Leavenworth, Kansas executed "Prairie Warrior," its annual capstone exercise with the graduating Command and General Staff Officer's Course (CGSOC) class. The exercise served as a laboratory for a futuristic US Army division called the

Mobile Strike Force (MSF). The MSF was a conceptual, fully digitized, heavy division equipped with the technologies and systems projected to be available at or near the beginning of the 21st Century.¹⁰ This experimental division was part of a larger Training and Doctrine Command (TRADOC) initiative to design a force capable of meeting future worldwide threats to US national security.

The MSF was designed to perform operational maneuvers, which involved the conduct of operations beyond the forward line of troops (FLOT). These cross FLOT operations presented unique logistical challenges, such as security of extended lines of communication. Long before the exercise began, planners recognized that sustainment of the MSF was the most critical, yet the most difficult piece of the concept. The CGSC student text, entitled Operational Concepts for the Mobile Strike Force, acknowledged that "Logistics in support of the MSF is key to the success of the division."¹¹

While the logistical challenges of supporting a division in deep maneuver are unique, they are not unprecedented. Historical examples of such operations abound. Colonel Grierson's famous raid during the American Civil War offers an excellent illustration. Early in the morning of April 17, 1863, a volunteer brigade under the command of Colonel Benjamin Grierson rode south from their headquarters just above the Mississippi border. Sixteen days, 600 miles, and a number of skirmishes later, the Sixth and Seventh Illinois Cavalry Regiments entered Baton Rouge in triumph, having marched the entire length of the state of Mississippi.¹²

The raid was part of General Grant's 1863 Vicksburg Campaign. Grierson's primary mission was to "cut the railroad [and other public property] east of Jackson,

Mississippi" to interrupt the flow of supplies into Vicksburg. Second, his raid would serve as a diversion for General Grant's main effort and its imminent attack on Vicksburg.

Grierson's raid, deep into the heart of enemy territory, played a substantial role in General Grant's successful seizure of Vicksburg. The raid was heralded as "one of the most brilliant cavalry exploits of the war, to be handed down through history as an example to be imitated."¹³

Logistically, "It was Grierson who first set the example of what might be done in the interior of the enemy's country without any base from which to draw supplies."¹⁴ The inability to establish and maintain a secure logistics base has historically been a thorn in the sustaining arm of deep maneuver forces. To retain its mobility and maintain its flexibility, Grierson's raiders could not carry huge quantities of supplies. They departed their base camp in La Grange, Tennessee carrying only the most essential supplies. Each of Grierson's 1,700 cavalymen was issued "Oats in the nosebags, and five days rations in haversacks, the rations to last ten days. Double rations of salt. Forty rounds of ammunition."¹⁵ They had little alternative but to live off the land and the spoils of their raids.

Logistical support for modern deep maneuver forces will undoubtedly prove more complicated than logistical support for Grierson's raiders. The sheer density of equipment, size of deep maneuver forces, diversity of weapons systems, mobility requirements, consumption rates for ammunition and fuel, and increased range and lethality of enemy weapons systems, have combined to render support to deep maneuver forces extremely hazardous and complex.

This paper will answer the question of whether or not a modern, division-sized mobile force is logistically supportable in the conduct deep of maneuver. The basis for this discussion, and the standard against which to apply the criteria, will be the "Prairie Warrior" 1994 MSF concept of employment. Comparisons will also be drawn to the former Soviet Operational Maneuver Group (OMG). At worst, the MSF concept will provide a rough draft of the US Army's current concept of a deep maneuver operations. At best, it will provide a glimpse into emerging doctrine and the inherent logistical challenges associated with that doctrine. In either case, it will serve as an excellent platform from which to launch a discussion on logistical support for divisions in deep maneuver. Further, the paper will highlight concerns with the integration of MSF operations and support concepts.

The paper will examine the six tactical logistic functions, the five logistic characteristics, and the potential impact of digitization on logistical support to derive an answer to the research question. First and foremost, the criteria used to determine feasibility will be the six tactical logistic functions: manning, arming, fixing, fueling, moving, and sustaining the force. Second, the five logistic characteristics outlined in FM 100-5 will be discussed throughout the paper in relation to the question. However, they should not be viewed as criteria. They are tenets of successful logistic operations and must be maximized within each of the logistic functions. The five logistic characteristics (sustainment imperatives) are *anticipation, integration, continuity, responsiveness, and improvisation.*

These five characteristics facilitate effective and efficient logistics operations.¹⁶

Logisticians must *anticipate* the requirements of their supported units. The concept of support must be fully *integrated* with the concept of operations. Logistics units must be *responsive* and able to provide support at the right time, in the right place, and in the right quantity. *Continuity* implies no interruption in the flow of supplies. *Improvisation* is the ability to adapt to change and adversity. Often, doctrinal approaches to sustainment operations do not work or traditional techniques and procedures become outdated and ineffective. In these cases, logisticians must be innovative in finding new ways to provide support.

Finally, the paper will explore whether digitization of the battlefield can improve logistic operations. Digitization is the most unique aspect of the MSF and, in large measure, the reason why many believe the MSF concept of deep maneuver will succeed where others have failed.

II. Concept of Employment

While Colonel Grierson's raid demonstrated the difficulty of logistically supporting a deep maneuver force, the concept of employment for the former Soviet OMG is perhaps more recent and more comparable to the MSF concept of employment. In fact, the origins of the MSF concept can be traced to the OMG concept and even earlier.

OMGs were the conceptual offspring of Soviet *mobile groups* which successfully conducted deep operations during World War II.¹⁷ OMGs were a technological enhancement of mobile groups, and arguably, the MSF was a technological and organizational enhancement of the OMG. Additionally, Soviet planners stumbled over

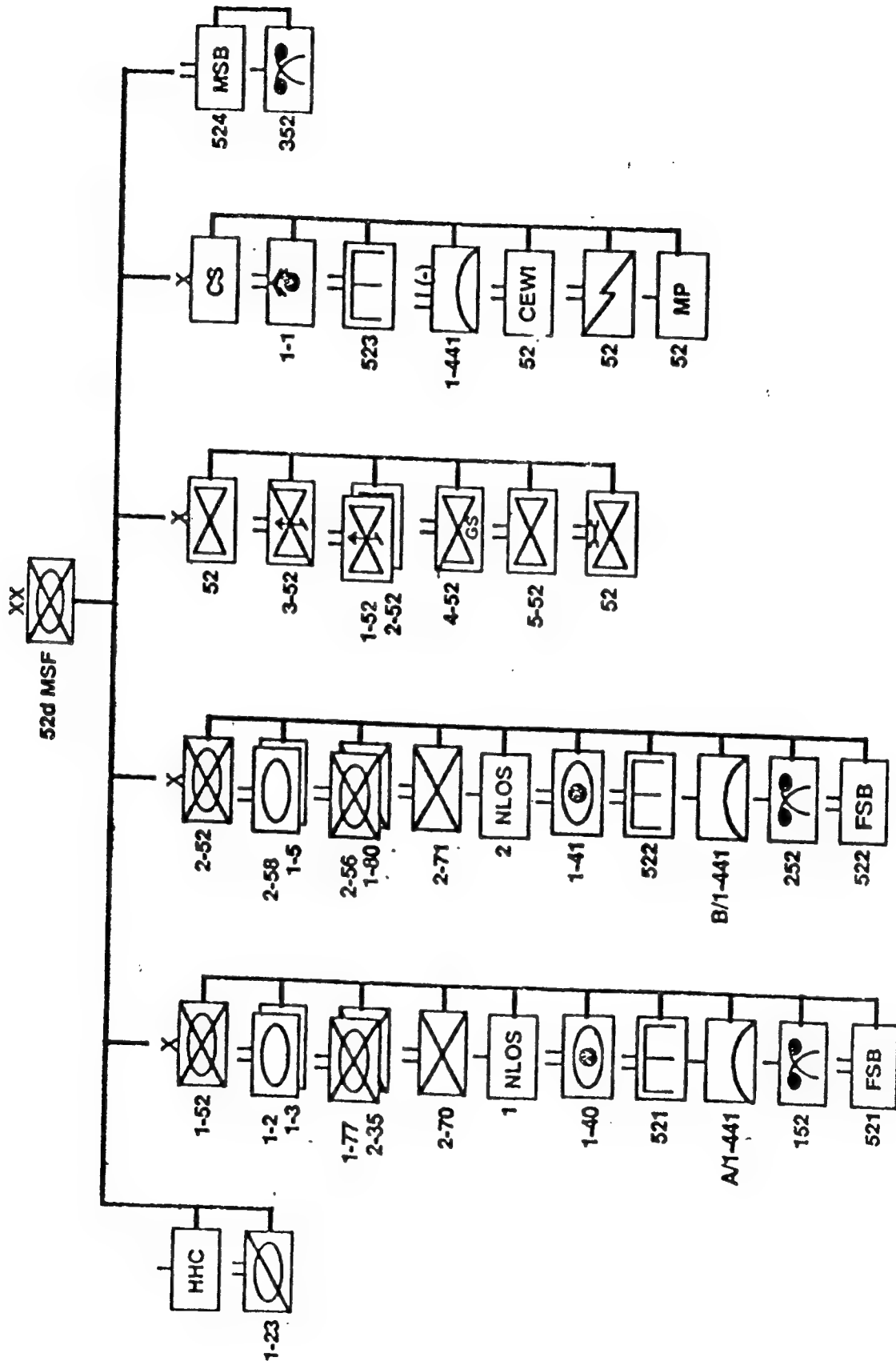
many of the same logistical hurdles that confronted developers of the MSF concept. This section will address the similarities and differences of the OMG and MSF concepts of employment.

"Organized with two combined arms ground maneuver brigades, an aviation brigade, a combat support brigade, a cavalry squadron and a divisional support battalion," the MSF was designed to conduct deep operational maneuver.¹⁸ This operationally decisive force would operate as far as 300 kilometers behind enemy lines to conduct the following missions:

- ♦ Maneuver to secure key terrain or facilities at operational depths.
- ♦ Maneuver to cut enemy LOCs.
- ♦ Conduct exploitation following penetration.
- ♦ Conduct pursuit.
- ♦ Maneuver to complete destruction of enemy forces following precision deep strikes.
- ♦ Conduct an operational counter attack in support of the defense.
- ♦ Serve as an operational reserve.
- ♦ Defend or cover during the build up of forces in theater, as the first-in heavy force.¹⁹

Again, none of these missions were unique to the MSF. Nonetheless, the central issue for the MSF was whether its logistics apparatus supported attainment of its mission.

Digitization of the battlefield was another US Army initiative, and it was fundamental to understanding the MSF concept of employment. It was intimately connected with the concept of "battle command," which was introduced in the 1993



version of FM 100-5, Operations. Battle command was defined as:

The art of battle decision making, leading, and motivating soldiers and their organizations into action to accomplish missions. It includes current state and future state, then formulating concepts of operations to get from one to the other at least cost. It also includes assigning missions; prioritizing and allocating resources; selecting the critical time and place to act; and knowing how and when to make adjustments during the fight.²⁰

Conceptually, digitizing the battlefield would afford commanders and staffs greater *situational awareness* and a *common picture* of the battlefield, which would speed up the decision making process and enable commanders to react more rapidly than their enemies. In essence, digitization would aid the commander in exercising his battle command. It was envisioned that the MSF would have a "continuously updated, common database - friendly situation, enemy situation, logistics, environmental (terrain/weather)- that would provide an accurate, common view of the battlefield from division down to individual tank commander."²¹

It was also important to note that the MSF and its accompanying logistics package [corps support battalion (CSB)] were considered theater assets. The MSF was an extraordinary force, the only fully-digitized friendly unit on the battlefield. It was the theater commander's "trump card," and he could play it at the time and place of his choosing to achieve operational effects. The theater commander would decide the mission of the MSF and the corps to which the MSF would be assigned to accomplish that mission.

The concept of support for the MSF was also strongly linked to digitization; therefore, digitization had major logistical implications. The G-4 (logistics planner), for instance, had access to the same common picture of the battlefield as the G-3 (operations

planner). Theoretically, this near-real-time information would enable logisticians to operate with a greater degree of certainty, efficiency, and accuracy. Logistic activities could maintain greater asset visibility, reducing the requirement for large quantities of on-hand stocks. Requisitions would more quickly and easily pass from the supported unit to the source of supply, which would dramatically improve logistics response time. This rapid response capability would be essential for supporting a mobile force.²² Logisticians could more accurately anticipate future requirements, and in doing so, enhance the continuity of support. Digitization of the battlefield would exert a major influence on logistical operations within the MSF.

Notionally, the support structure was designed to give the MSF a 300 kilometer/five to six day deep operations capability. The MSF would conduct its operations independently, often isolated from other friendly units. Consequently, it was imperative that the MSF be completely self-sustaining, 100 percent mobile, and able to carry 100 percent of its required logistical support. All of its supplies would have to remain uploaded, and its transportation assets would have to be capable of maintaining a high maneuver operational tempo (OPTEMPO). Its logistics units had to be "survivable, mobile, and capable of self-defense."²³ Additionally, the MSF would be heavily reliant on aerial means of resupply for fuel, ammunition, food, and medical evacuation.

Planners of the Prairie Warrior exercise recognized that the logistical assets in the MSF modified table of organization and equipment (MTOE) was insufficient to support the division. To increase the MSF's logistical potency, planners tailored a corps support

battalion (CSB) to provide direct support (DS) and general support (GS) to the division.

The command relationship of the CSB to the MSF was operational control (OPCON).

Table 1
Units Assigned to the CSB

Ammunition Company (MOADS/PLS)
Transportation Company (medium truck/PLS
Transportation Company (medium truck/petroleum)
Transportation Company (HET)
Transportation Company (medium truck)
Quartermaster Company (supply), DS
Quartermaster Supply company (POL), GS
Maintenance Company, DS
Medical Company
Medical Evacuation (MEDEVAC) Air Ambulance (UH-60)
Mobile Army Surgical Hospital (MASH)
Explosive Ordnance Detachments (EOD) (x 2)

This robust organization bolstered the logistical support available to the MSF, but it also significantly increased the MSF's logistic signature.

The CSB that was OPCON to the MSF was unique in several ways. First, CSBs normally provided support on an area basis to nondivisional units in the division rear area. In this scenario, it supported the MSF (a division) exclusively. Second, CSBs were not usually OPCON to divisions. They were usually subordinate to corps support groups (CSG). During the Prairie Warrior exercise, the CSB took its directions primarily from the MSF which created a rather peculiar command relationship.

Third, the CSB did not have well established sources of supply (SOS). Its SOS varied with the mission of the MSF, the conditions under which the MSF was committed to fight, and the logistical capabilities of the corps to which the MSF was operationally attached. During Prairie Warrior, the MSF was OPCON to the II (US) Corps (notional).

Its mission was to exploit the success of two preceding divisions by penetrating a weak point in the enemy's defense and subsequently attacking objectives deep in the enemy's rear. In this case, the 2D Corps Support Command (COSCOM), the major logistical element of the corps, was the CSB's SOS. Had the MSF been given a different mission and attached to another corps, the COSCOM of the receiving corps would have become the CSB's SOS.

Additionally, all COSCOMs were not the same, which significantly effected the degree of logistical support the MSF and the CSB could reasonably expect to receive from one corps to the next. A COSCOM that was tailored and accustomed to supporting light and mechanized units, for example, would find it difficult to support the MSF, which possessed several unique weapons systems, munitions, and other items of equipment. Structurally, these COSCOMs would not have the necessary supplies, repair parts, transportation assets, ammunition, or fueling assets to sustain the MSF or act as the CSB's SOS. The MSF faced these issues and many other logistical challenges that will be discussed in the next chapter.

The OMG concept of employment was derived from the former Soviet Union's doctrinal emphasis on attacking the enemy throughout the depth of his formation.

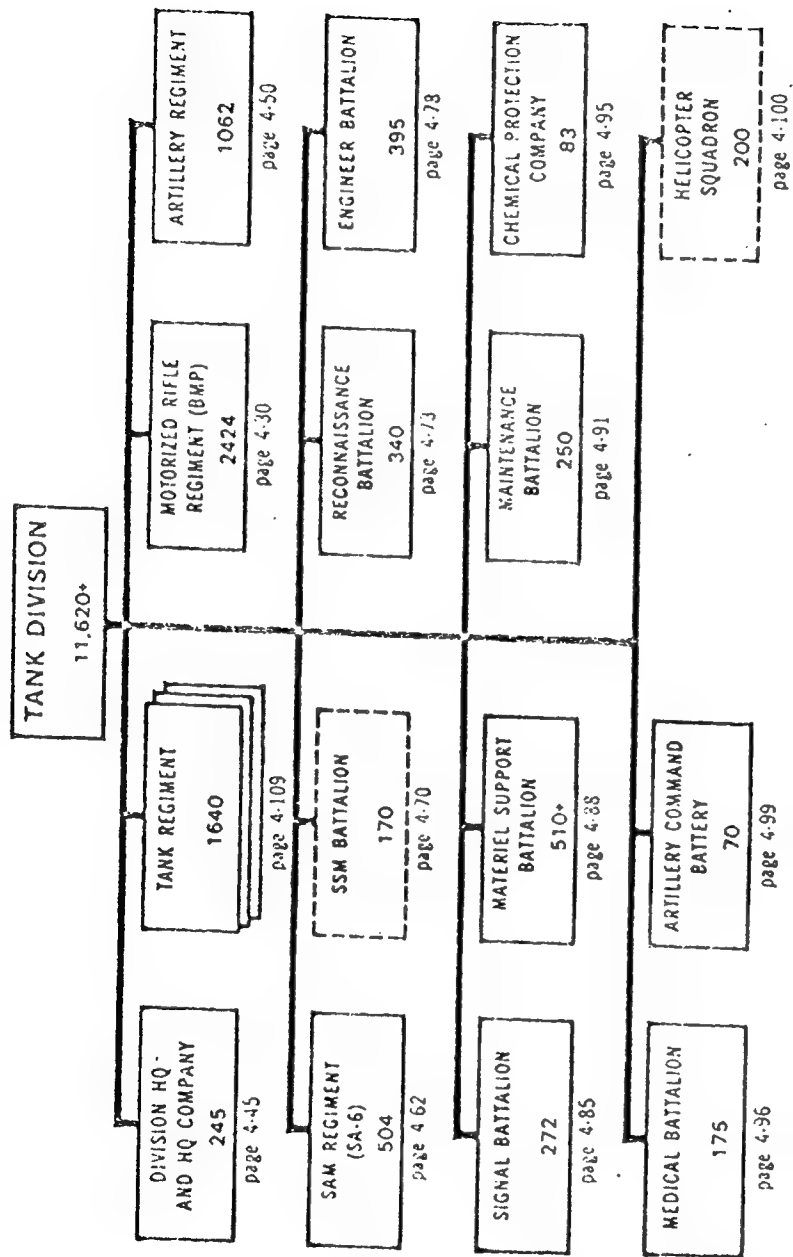
The Soviets maintained that their success in the last 18 months of World War II was based on a series of offensive deep operations and sub-operations which in stages allowed the advance from western Soviet Union, through Poland, to Berlin. The war was concluded by the most ambitious and far-reaching deep operations of all against the Japanese in Manchuria in 1945.²⁴

The OMG represented a rebirth in Soviet doctrinal emphasis on deep attack. The OMG was essentially a modern, more powerful mobile group.

The OMG was a highly mobile (usually tank heavy) combined arms formation intended to operate ahead of the main body of Warsaw Pact frontal forces.²⁵ It was to be committed through a gap created in enemy [North Atlantic Treaty Organization (NATO)] defenses by first echelon forces to conduct deep operations in the enemy rear. Once through and into the rear, the OMG would seek to move rapidly toward a specific objective located up to 300 kilometers deep.²⁶ It could also operate in conjunction with first echelon forces if enemy defenses were perceived as weak or unprepared. Other missions of this corps or division (usually division) sized element included destruction of enemy rail lines, command and control facilities, seizure of POMCUS (pre-positioning of material configured to unit sets) sites, and seizure of key bridges or tunnels.

Another key aspect of the OMG concept was its employment against targets of operational rather than tactical significance. OMGs would avoid decisive engagement in order to maintain maximum combat power for the longest extent possible.²⁷ Its objectives were not force-oriented, except in cases where it was specifically tasked to find and prevent the commitment of the enemy's operational reserve. Basically, its mission was to exploit the success created by first echelon forces, disrupt enemy rear operations, conduct raids on enemy supply depots, and create favorable conditions for the rapidly-advancing second echelon forces.

Logistically, the OMG was self-contained and carried three to five days supply of food, fuel, and ammunition.²⁸ The OMG planned to supplement its supplies with captured enemy stores, which would extend the length of time it could operate, prior to its linkup with follow-on forces, to a week or more. The implication was that NATO support units,



NOTES: 1. The TD may have a SAM regiment equipped with the SA-8 SAM (p. 4-101) or an AAA regiment equipped with the S-60 AA Gun (p. 4-104) instead of the SA-6 SAM regiment.

2. Armies in WGF are consolidating division-level SSM battalions into army-level SSM brigades.

3. Starting in 1989, the Soviets are converting one of the TRs of the TD into a second MRR.

4. Not all divisions have a helicopter squadron.

facilities, and supplies were lucrative targets for OMGs. OMGs would also make extensive use of both rotary and fixed winged aircraft to facilitate their resupply operations. For this reason, OMGs were likely to view NATO airfields as critical targets.

There were many similarities between the MSF and OMG concepts of employment. First, their missions were very similar. Second, they both employed combined arms division-sized elements with a planned depth of penetration of roughly 300 kilometers. Third, both were designed primarily to exploit successes created by other front-line forces. Neither the OMG nor the MSF would initially seek enemy contact. Finally, and most importantly, they were both designed to achieve operational effects.

Logistically, they would both consumed large quantities of supplies and operated on long, tenuous lines of communication. They would both be expected to "live off the land" for periods of time to augment their existing supplies. This would present both organizations with some severe logistical vulnerabilities, especially in critical classes of supply. For example, it would be unlikely for a division-sized deep maneuver force to fulfill its total ammunition requirement by living off the land. Heavy reliance on aerial resupply, rotary and fixed wing, was also a key feature of both organizations.

There were also considerable differences between the MSF and OMG concepts of employment. First, the MSF had a fixed structure. It was MSF was organized with two combined arms maneuver brigades, an aviation brigade, a combat support brigade, a cavalry squadron and a divisional support battalion. The Soviets, by contrast, tailored the OMG from available forces to accomplish specific missions. The OMG did not have a fixed task organization, and it employed regular forces rather than extraordinary forces.

At the Army level, a tank division was ordinarily designated to spearhead the OMG. The OMG could also be expected to employ airborne and air assault forces. "Air assault battalions and brigades were generally available at the army and front levels, along with helicopter lift. A half dozen airborne divisions remained as national assets for employment against high-priority objectives."²⁹

The OMG's general support came from centralized front assets. As the OMG began to move forward, it would "pick up these supporting elements just before it was committed."³⁰ Some of these supporting elements included logistics and artillery organizations. Regarding the MSF, we currently have no front level force (i.e. army group equivalent) from which to draw assets.

Perhaps the most meaningful difference is the MSF's extensive use of information technology. The MSF, as mentioned, is a fully-digitized division. Digitization is the basis for this extraordinary division. Without digital technology, it would have been an ordinary division, with no perceptible advantage over other divisions. With only two ground brigades, it may have in fact become disadvantaged without the use of digital technology. The OMG, by contrast, did not possess a digital capability.

Clearly, the MSF and OMG were alike and different in many ways. Both concepts have advantages and disadvantages. This comparison of the two concepts will aid further analysis of the research question. Perhaps there are elements of both concepts that should be studied when considering the logistical feasibility of supporting deep maneuver forces. The paper will now examine some major logistical challenges and concerns created by the

MSF concept of employment. It will also address the common concerns and challenges faced by Soviet planners in supporting OMGs and by US planners in supporting the MSF.

III. MSF Logistical Challenges and Concerns

The MSF concept of employment raised many logistical concerns. Foremost among them was the concern for protection of logistic assets. As the MSF moved deeper into enemy territory, its logistical assets became extremely vulnerable to enemy attack. Therefore, inherent in all MSF missions was a 360 degree security requirement. Conceptually, the MSF would not receive mutual support from other ground units, because it operated well beyond the forward edge of the battle area (FEBA). There were no friendly units to the immediate left, right, front, or rear of the MSF. Soviet planners also wrestled with this concern, and were unable to resolve it. Ultimately, the Soviets gambled that the enemy would be unable to gather sufficient combat power to cut off the logistical tail of the OMG.

Second, the huge signature created by the length of the division's logistical tail compounded the problem of protecting logistic assets. In addition to security concerns over the division's internal logistic assets, the MSF was deeply concerned with security for the CSB. The CSB was as vital to the success of the MSF as the forward support battalions (FSB) and the main support battalion (MSB); it considerably improved the "staying power" of the MSF. The CSB was also the lifeline between the MSF and any supplies coming from the corps rear and theater support areas. For this reason, there existed a symbiotic relationship between the MSF, its organic logistic elements, and the

CSB. They were mutually dependent upon one another, arguably to a greater degree than in ordinary divisions.

Third, the usual distinction between rear and forward areas became blurred. Rear support units in divisions with more conventional missions were generally considered less vulnerable to attack (ground) than forward support units. The concept of deep maneuver shattered this presumption. Proximity of units operating in division support areas (DSA), usually considered rear, were as close to the enemy as units operating in brigade support areas (BSA), usually considered forward. Therefore, the designation of support areas as either rear or forward became meaningless, as it did not afford a greater or lesser degree of protection. To a greater extent than other divisions in the Prairie Warrior exercise, the MSF would operate in a more nonlinear fashion.

Fourth, the OPTEMPO of the MSF, and the requirement for its support vehicles to be equally mobile, was another major concern. The maneuver and fire support elements of the MSF were designed to operate at high tempo. Logistics elements had to be capable of supporting the force without significantly degrading OPTEMPO, which demanded assets equal in mobility to those of maneuver elements.

Fifth, logistic lines of communication (LOC) were a big concern. The MSF concept of support involved ground and aerial resupply. Three hundred kilometer long LOCs would obviously present significant challenges to resupply from corps and theater level units. In addition to being long, the LOCs were also unsecured. Because of the length of the logistics tail, even LOCs internal to the division would not be completely

secured. Yet, continuity of logistical support hinged on secure LOCs. In reality, the MSF's supply lines were more vulnerable than those of its enemy.

Sixth, and equally troubling, was the requirement to sustain the MSF for as many as six days behind enemy lines. Essentially, all supplies had to remain uploaded, and its logistics units would have to be 100 percent mobile, in a single lift. Single lift was critical because logistics units would not have time to shuttle supplies. Supplies could not be placed on the ground, because doing so would reduce logistical mobility and responsiveness. Additionally, the MSF would have limited material handling equipment (MHE), and would therefore be unable to continuously upload and download supplies. Sustainment of the division also relied heavily on aerial resupply.

Seventh, there were a number of concerns over the logistical organization of the division. Of primary concern was the lack of a division support command (DISCOM). Additionally, the forward support battalions (FSB) were organic to the maneuver brigades.³¹ Without a logistics commander, the division G-4 assumed responsibility for logistic operations, in addition to his normal responsibility for logistic planning.

A related organizational concern was whether the G-4 staff could effectively perform both functions. In US Army heavy divisions, the DISCOM commander is the principal logistics operator. He exercises full command authority over all organic units of the support command. Among the tasks the DISCOM commander oversees are:

- ♦ Support of Class I, II, III, IV, VII, VIII and IX supplies.
- ♦ Operation of ammunition transfer points.
- ♦ Direct support maintenance.

- ♦ Materiel management.
- ♦ Transportation of personnel, supplies, and equipment.
- ♦ Salvage operations.
- ♦ Providing logistics advice to the division commander and his staff.
- ♦ Echelon I and II health service support.
- ♦ Conduct of rear operations.
- ♦ Receipt storage and issue of unclassified maps.³²

Field services also fall within the purview of the DISCOM commander. These services include: field feeding, mortuary affairs, airdrop, laundry and shower support, clothing and textile repair, and water purification. In essence, the logistics commander oversees all sustainment operations to ensure a cohesive, integrated effort. The G-4, on the other hand, has coordinating staff responsibility for planning. He develops division-level plans, policies, and priorities, which are carried out by the DISCOM.

In the MSF, the G-4 section was larger than in a heavy division G-4. It included an operations and support section, plans section, and liaisons from the materiel management center (MMC) in the main support battalion (MSB), the division transportation office (DTO), and division ammunition (DAO).³³ This conglomerate greatly increased the span of control of the G-4.

More significantly, the G-4 did not possess the necessary command authority to direct logistic operations and carry out the additional responsibilities. In the current US heavy division structure, the DISCOM commander has the authority to direct the cross-attachment of logistics assets between logistics organizations, as necessary, to

support the concept of operations and to ensure continuity of operations. During offensive operations, for example, the commander may direct that the MSB attach a specified number of its 5,000 gallon fuel tankers to each of the FSBs. This method maximizes the amount of fuel immediately available to support the maneuver brigades and their slice elements during high OPTEMPO. A logistics commander could enforce this directive because all logistics organizations and assets belong to support command.

The G-4 in the MSF, however, had no such authority. The G-4 developed the concept of support and made recommendations as to the employment of logistic units, but he could not direct these activities. If the MSB commander objected to the cross-attachment of assets, for example, the G-4 was powerless to enforce his recommendations. An even greater problem existed with the FSBs, since they fell under the command and control of the maneuver brigades.

The assistant division commander, support (ADC-S) was the first commander within the chain of command who could resolve logistical disagreements. This method of resolving the disputes, which inevitably arose, was extremely inefficient and unresponsive to pressing logistic demands. In most instances, the ADC-S became involved in logistical matters by exception only. Routine operations remained a G-4 responsibility, which again points to the elemental flaw in the logistical command and control structure of the MSF. Omitting the logistics commander from the divisional structure, thus placing the total weight of the logistics effort on the shoulders of the G-4, threatened overall logistics responsiveness, integration, and continuity.

IV. Analysis of the MSF

This section of the paper will explore the logistical requirements for sustaining a force division in deep maneuver. The requirements will be addressed within the framework of the six tactical logistics functions: arming, fixing, fueling moving, manning and sustaining. The MSF table of organization and equipment (TOE) is the basis for examining these requirements, but it is only intended to be used as an example. The TOE is a draft; therefore, it is not completely accurate. It can, however, be used to derive some gross planning figures.

During the Prairie Warrior exercise, the MSF also received several enhancements which were designed to improve the MSF's logistical efficiency and effectiveness. Some of the logistical enhancements were digital and automated aids, while others were merely vehicle and equipment improvements (see Appendix 1 - Logistics Enhancements). The effectiveness of these enhancements would be measured by how well they supported the six tactical logistic functions: manning, arming, fixing, fueling, moving, and sustaining. No matter how grand the tools, they would have limited utility if they did not contribute to the effective performance of these functions. Ultimately, the concept of digitization would also have to pass this litmus test. Since any concept of support for deep maneuver forces must meet these conditions, the paper will now address the logistic functions in relation to the research question.

Manning

Manning the force encompasses personnel readiness management, replacement management, and casualty operations management. Personnel readiness management is

the process of distributing soldiers to subordinate commands based on documented manpower requirements or authorizations and commanders priorities. Replacement management is physically receiving, accounting, processing, supporting, equipping/requipping, training, and delivering military and civilian replacements personnel from points of origin to ultimate destinations. Casualty operations management involves recording, verifying, and processing information from unit level to Headquarters, Department of the Army; notify appropriate individuals; and provide assistance to next of kin.³⁴

Manning operations will present significant challenges to deep maneuver, but they are unlikely to be the cause of mission failure. This is due largely to the concept of employment. In most cases, other units establish favorable conditions for the successful employment of deep maneuver forces. Soviet first echelon divisions, for example, normally created favorable conditions for the OMG. Regarding the MSF, other divisions of the corps to which it was operationally assigned established these conditions. For this reason, deep maneuver forces are expected to suffer fewer casualties than will divisions operating under less advantageous terms. Deep maneuvers offer the potential for high returns with few casualties, relative to other divisions. In this case, manning requirements should not be vastly different from those of ordinary divisions.

On the other hand, deep maneuver is inherently risky and could result in higher than normal casualties. This would greatly complicate manning operations. The fluidity and rapid tempo of deep operations would place greater stress on the manning system by requiring these operations to happen more quickly. Higher casualty rates could certainly

place a larger burden on the personnel accounting system. This would negatively impact both casualty management and replacement operations. Essentially, personnel accounting is the driver for all of the other manning activities.

The uniqueness of deep maneuver forces such as the MSF could create additional manning challenges. "What is the sources of this extraordinary division's personnel replacements" becomes a logical manning question. Undoubtedly, the digitized nature of this division will create personnel requirements that are different from requirements of ordinary division. For example, the corps to which the MSF was assigned was not digitized and could not provide replacements that were fully trained in the use of digital technology. Replacement flow is a thorny issue.

There are, however, factors that can mitigate these challenges. First, deep maneuver forces can be assigned missions of relatively short duration, three to four days. If the necessary conditions for its employment are established, its casualties can be minimized and its personnel readiness maintained for the duration of the mission. Second, any future concept for deep forces must include robust helicopter lift support. Both the OMG and MSF, for instance, employed aviation brigades. Some of these lift assets would have to be dedicated to manning operations. In many situations, ground transportation means will prove unable to keep pace with replacement requirements.

It is likely, however, that deep maneuver forces will not receive replacements during the course of their assigned missions. To maintain their readiness, they will have to rely on internal *reorganization*. "Reorganization is the action to shift resources within a degraded unit to increase its combat effectiveness."³⁵ At the conclusion of the mission,

personnel replacements will flow from theater or even national resources. Corps may be ill-equipped to support extraordinary force personnel replacement operations.

Certainly, there are difficulties in the manning area, but none of the issues is insurmountable. Other sustainment operations pose far greater difficulties.

Arming

This aspect of sustaining will provide the greatest challenge to the logistics system, save fueling support. Arming the force involves providing the required quantity of ammunition to the combat user at the time and place it is needed.³⁶ Current US doctrine employs the use of ammunition transfer points (ATP) and ammunition supply points (ASP). Typically, one ATP is found in each BSA. Each ATP can provide 550 STON of ammunition per day.³⁷ The DS (MOADS) company operates another ATP in the division rear area and three ASPs. The rear ATP can provide 970 STON of ammunition per day, and each ASP can provide 710 STONs per day.³⁸

The great challenges to ammunition operations are always lift, distribution, and mobility, and they apply doubly to deep maneuver forces. The palletized loading system (PLS) (see Appendix 1-Logistical Enhancements) can lessen the distribution problem and reduce the lift problem in ATPs and ASPs. "Under MOADS/PLS, combat configured load CCLs will arrive in the ATP secured to PLS flatracks also called sideless containers. These flatracks will be offloaded from corps transportation assets and set on the ground where they will remain until the PLS equipped user arrives with his vehicle that is designed to pick up the PLS flatrack and transport it to the user area."³⁹ The difference in this procedure for deep maneuver forces, however, is that ammunition will not be placed on

the ground. It will be offloaded from the flatracks of supporting units the flatracks of supported units. This reduces the material handling equipment (MHE) requirements in ATPs and ASPs, which will save both personnel and equipment resources. PLS is an absolute necessity for deep maneuver forces.

Despite the enhancing effect of PLS, ammunition operations will likely become more complex for deep maneuver forces. First, the number and types of munitions in ATPs and ASPs will increase, given the growing emphasis on precision munitions and new warfighting systems.

The Army will locate, and attack, and destroy the threat's capability to wage war well in advance of friendly lines (deep). This requires precision deep attacks against threat maneuver formations and his logistical and command lines of communication while simultaneously denying him safe sanctuaries. Paramount to achieving this objective are: real-time, near perfect intelligence, coupled with concentrated, coordinated strikes by weapons systems using smart and brilliant munitions.⁴⁰

This quote addresses much of the conceptual framework of the MSF, which also uses advanced weapons systems and munitions. The newer systems and munitions used by the MSF during Prairie Warrior included: Army Tactical Missile System (ATACMS), Brilliant Anti-Armor Submunition (BAT), Multiple Rocket Launcher System (MLRS), self-propelled Howitzer (PALADIN), Sense and Destroy Armor (SADARM), Line-of-Sight Antitank (LOSAT), Longbow Missile, and Longbow Hellfire Missile. Some of these munitions will actually replace older, less effective ones. Most, however, will be used in addition to existing munitions. There will be a net gain in the variety of ammunition used during combat operations. These are some of the new types of munitions and weapons systems that deep maneuver ATPs and ASPs can expect to support in the future.

Ammunitions points may also carry a larger volume of ammunition. The DS (MOADS) ASP will normally maintain 1 to 3 days of supply (DOS) of ammunition.⁴¹ ATPs normally carry 1 DOS. In divisions that are directly connected to corps and theater logistics assets, via their lines of supply, ammunition resupply is a challenging operation. Deep maneuver forces are self-contained and disconnected from their supply lines, which complicates resupply even further.

A combination of two approaches can lessen the strain on the ammunition resupply operations. First, deep maneuver forces may carry all of the ammunition that it expects to use for the entirety of the mission. Returning to the MSF example, it planned to conduct operations for five to six days. If the current doctrine were employed, the MSF would experience a severe shortfall in ammunition, with only 1 DOS in ATPs and 3 DOS in ASPs. To be self-sufficient, the MSF would have to haul the entire 5 to 6 DOS, which would double, possibly triple its transportation requirements.

Second, the deep maneuver force could carry a designated portion of its total ammunition requirement and depend upon air resupply from the nearest corps-level ammunition unit. This option would limit the flexibility of the MSF, but it would enhance its over mobility. Seizure of airfields, landing zones, and drop zones would figure prominently into all courses of action to ensure ammunition resupply. As aerial operations are largely weather dependent, weather could also exert a bigger influence on resupply operations and ultimately on the deep force's accomplishment of the mission.

Soviets plans to resupply the OMG assumed a large amount of air resupply. Charles K. Dick, author of an article entitled "Soviet Operational Manoeuvre Groups: A

Closer Look," studied air resupply as an option for OMGs. "In analyzing the practical problems of handling an OMG, he considered that air resupply could be very effective as regards ammunition."⁴²

Air resupply, however, consumes a huge amount of aerial resources. "Assuming that Soviet ammunition consumption will be about equal to that of US forces, it would require 25 flights of the largest Soviet cargo aircraft (the AN-22) to meet the ammunition needs alone of a tank division engaged in heavy combat for one day."⁴³ This evidences the potential magnitude of aerial ammunition resupply operations and assets required to sustain deep maneuver forces.

Fixing

Fixing (maintenance) the force involves keeping materiel operational, restoring it to an operational condition, and upgrading its usefulness through design modification. There are four levels of maintenance (less aircraft): unit, direct support (DSM), general support (GSM), and depot.⁴⁴ Each level has specific functions and tasks it may perform.

Table 2. Levels of Maintenance

Levels	Functions	Task	Organization
Unit	Equipment maint	Service & Repair	Co/btry/troop
DSM	Repair & return	Replace & Repair	TOE/MTOE maint unit
GSM	Repair & return to supply system	Repair & Overhaul	TOE/MTOE maint unit HNS, contract
Depot	Repair & return to supply system	Overhaul & Rebuild	AMC, HNS, contract

ST 63-1 p. 4-1.

Deep maneuver operations also demand a slightly different approach to maintenance management, beginning with the tasks and functions to be performed at the various levels of maintenance. The table above shows repair and overhaul taking place at

the GSM level. In the case of the MSF, the CSB provided GSM. In reality, the CSB would not have had time to conduct repair and overhaul, given the rapid tempo of MSF operations. For this reason, deep maneuver forces should not plan for maintenance support above DSM level during the conduct of the mission. It may plan for GSM level maintenance during the reconstitution phase of its operations. Its uniqueness may also demand a greater degree of depot level maintenance, if the necessary parts and expertise are not available within GSM level maintenance organizations to perform depot level tasks and functions.

Reducing maintenance time lines is a related issue. Time lines are based on Mission, Enemy, Troops, Terrain, and Time (METT-T) and are therefore adjustable. However, FM 63-21 Main Support Battalion, offers the following guidelines.

Table 3. Maintenance Timelines

Location	Hours
On site	2
Unit maintenance collection point (UMCP)	6
Brigade Support Area (BSA)	24
Division Support Area (DSA)	36

FM 63-21, p. 6-3

Deep maneuver forces will have to place an even greater premium than ordinary division on fixing systems as far forward as possible to reduce maintenance time lines. The goal must be to minimize the number systems that require evacuation to a higher level of maintenance. In an effort to reduce the size of the logistics tail, deep maneuver forces will likely have fewer evacuation assets. More DSM personnel will operate forward of the BSA in the UMCP.

Deep maneuver forces must also rely even more heavily on battlefield damage assessment and repair effective (*BDAR*), controlled exchange and cannibalization procedures. "BDAR are techniques used to expedite return of a damaged piece of equipment to the current battle. *Controlled exchange* is the systematic removal of serviceable parts from unserviceable, economically repairable equipment. *Cannibalization* is the authorized removal of serviceable parts from unserviceable, uneconomically repairable equipment."⁴⁵ Deep maneuver forces will have to maximize the use of these procedures to return as much equipment as possible to the battlefield as quickly as possible. They will also place a higher priority on component replacement than on repair of components, except in the cases where replacement time exceeds repair time.

Additional thought must also be given to the disposal of equipment that is not repairable within the stated timeline. Deep maneuver force will not have the option to evacuate resources to rear support units; the closest maintenance unit to the deep force could be as much as 300 kilometers to the rear.

Two options are immediately apparent. First, the division could be outfitted with sufficient heavy equipment transporter (HET) to ferry unserviceable, combat critical (i.e. tanks, artillery pieces), items around the battlefield. The division commander would establish the priorities for fixing these items, and DSM personnel would fix them as the tactical situation permitted. Second, the equipment/vehicles could be "blown in place," once it was determined that the piece of equipment clearly could not be repaired within established maintenance times. These pieces would be cannibalized for parts prior to their

destruction. This would prevent equipment that is left behind from falling into enemy hands.

Obviously, these two options represent extremes; nonetheless, they illuminate a critical maintenance issue. The HET solution would dramatically increase the size of the logistics tail. There is also a high negative correlation between the size of the tail and the mobility of the division. The "blow in place" option destroys valuable assets that are potentially repairable at higher levels of maintenance. This issue will have a tremendous impact on the overall conduct of maintenance operations within deep maneuver forces.

Repair parts supply is another thorny issue. In current US heavy divisions, "All units maintain a prescribed load list (PLL) of parts designed to sustain the unit for a specified number of days. Direct support maintenance units maintain a more extensive repair parts stockage designed to replenish the needs of it supported units and its own needs."⁴⁶ These additional stockages are part of the division authorized stockage list (ASL). The ASL for forward maintenance companies (BSA) is normally limited to 3,000 lines of the most critical items, while the "the light maintenance company in the MSB (DSA) maintains a division ASL of 6,000 to 10,000 line items."⁴⁷ Current divisions find it very difficult to operate within these parameters. Yet, deep maneuver divisions will most certainly have to dramatically reduced the number of lines items in their ASLs to meet mobility requirements.

Maintenance operations for deep maneuver will be fraught with risk. Maintenance personnel will support even farther forward than in ordinary divisions. They will operate at times more autonomously, and in a less secure environment, as they move to repair

vehicles and other equipment closer to the line of fire. Nonetheless, these are some the requirements for successful maintenance operations in deep maneuver forces.

Despite these pressing issues, it is unlikely that maintenance operations will single-handedly cause the deep maneuver force to fail its mission. This is certainly not to imply that maintenance is unimportant. It can definitely help or hurt the division in the execution of its mission, but it is not the division's "Achilles' heal." Other factors are more likely to lead to the downfall of this force. If deep maneuver forces are given missions of limited duration and properly employed within the limits of their capabilities, maintenance operations should not severely hamper the division.

Fueling

Fueling the force involves providing the required quantity of fuel to the combat customer at the time and place it is needed.⁴⁸ The volume of bulk fuel required and the number of vehicles to haul the fuel is staggering. A typical armored division, using the NATO Standard, consumes approximately 500,000 gallons of fuel per day.⁴⁹ The DS fuel assets of a typical heavy division consists of sixty-four, 5,000 gallon fuel tankers, giving it a total DS fuel hauling capacity of 320,000 gallons of fuel. Supported unit organic fuel vehicles account for the remaining 180,000 gallons.

The requirement for fuel vehicles dramatically increases for deep maneuver forces, because the options for fuel resupply are much more limited than for any other class of supply. The volume of fuel required to support the force makes ground resupply the most effective means. Air resupply should be considered for emergencies and for very limited periods of time. Since the LOCs between other front line forces and deep forces is so

lengthy and unsecured, support from the rear is highly improbable. Thus, deep forces must haul the vast majority of their fuel.

Comparing the fueling assets of a typical US tank battalion to the assets of the notional MSF tank battalion offers a simplified example of the increase in the number of fuel vehicles. US tank battalions have twelve, 2,500 gallon fuel trucks.⁵⁰ The MSF tank battalion used during Prairie Warrior had sixteen, 2,500 gallon fuel trucks.⁵¹ The increase in FSB fuel assets is even more dramatic. FSBs under current US doctrine have ten, 5,000 gallon tankers, giving them a 50,000 gallon capacity.⁵² FSBs in the MSF had thirty-two, 3,500 fuel pods with a total capacity of 112,000 gallons of fuel.⁵³ This increase in assets punctuates the need for deep maneuver forces to maintain greater internal fuel reserves than divisions operating on more secure LOCs.

The high OPTEMPO also contributes to the increase in the number of vehicles. This tempo demands that all fuel accompanying the deep maneuver force remain uploaded and 100% mobile. "MSBs in US heavy divisions are outfitted with twelve, 10,000 gallon fuel bags (tank assembly fabric collapsible)," which are used to operate two fuel system supply points.⁵⁴ These collapsible storage tanks are placed on the ground and filled by corps and theater fuel trucks. This system minimizes the number of MSB fuel vehicles required to conduct bulk refuel operations. The MSB uses its 5,000 gallon tankers to provide bulk fuel to FSBs and retail fuel to units within the division rear area. Deep maneuver forces, by contrast, operate in a more fluid environment and are precluded from placing fuel on the ground.

Another requirement for deep maneuver forces is complete vehicle and equipment compatibility. As mentioned, the MSB used 5,000 gallon tankers while the FSBs used 3,500 gallon pods transported via the PLS. The division must standardize its assets to maximize the efficiency of refueling operations.

A final requirement is for more fuel-efficient vehicles, particularly for major "fuel guzzlers" such as tanks. The fuel tank capacity for the M1A1 and M1A1E2 combat tanks is approximately 500 gallons. Their cross-country rates of fuel consumption is about 57 gallons per hour of operation. To keep these tanks resupplied, along with the rest of the division, requires a huge number of fuel vehicles. Even modest gains in fuel efficiency could result in a significant reduction in the length of the fuel logistics tail. Fuel operations will continue to be the greatest challenge to sustainment of modern deep maneuver forces. Unlike Colonel Grierson's horses, "tanks cannot graze."⁵⁵

Moving

Moving the force is perhaps the most critical of the logistics functions for deep maneuver forces, considering their emphasis on high OPTEMPO and mobility. Indeed, "One of the main defenses of a deep operations formation is its ability to keep moving and not present a stationary, concentrated target."⁵⁶ Moving encompasses three basic functional areas: mode operations, terminal operations, and movement management services.⁵⁷ The most likely modes of transportation to be used by deep forces are air and road. Deep forces are likely to conduct only limited terminal operations. Movement management, which involves transportation movement and highway regulation, is the function most vital to successful deep operations.

In addition to its obvious link to OPTEMPO and mobility, the importance of movement management is again linked to the likely increase in the number of vehicles in deep maneuver forces and the need to execute efficient tactical marches. A typical US armored division has approximately 5,264 vehicles.⁵⁸ During Prairie Warrior, the MSF and its accompanying CSB accounted for over 7,000 vehicles. The increase resulted mainly from the number of support vehicles. Thus, the deep force faces a dilemma. Its concept of employment favors a short logistical tail, but its concept of support requires a much longer one.

Movement management is essential to executing tactical movements. "A heavy division at an open interval of 100 meters has a column length of more than 500 kilometers. In actual operations, with the appropriate march spacing, the column expands to 700 kilometers."⁵⁹ The MSF and its CSB at an open column would cover well over 800 kilometers, with appropriate march spacing. Movements are conducted over multiple routes to reduce the length of columns. This greatly increases the difficulty of movement operations and the necessity for sound movement management.

In US army divisions, the responsibility for movement management involves two key players, the division transportation officer (DTO) and the DISCOM movement control officer (MCO). The DTO's five staff functions are advising, planning, coordination, technical assistance, and evaluation. The DTO also serves as the formal link between the division and the corps movement control center (MCC). The MCO supports movement control through planning and controlling the use of the division's transportation assets. The MCO is the link between the division transportation mode

operators and transportation users.⁶⁰ The planner to operator relationship that exists between the DTO and MCO ensures well-coordinated transportation management. This aspect of US transportation doctrine is certainly a requirement for deep maneuver forces.

Deep maneuver forces may also require continued centralized planning but decentralization of transportation assets. This also implies a need for more transportation resources. The US heavy division, for instance, has one assigned transportation company. The CSB for the MSF had four transportation companies, essentially a transportation battalion minus the headquarters and staff element. Additional transportation is not only required for fuel and ammunition, but for all classes of supply.

To provide the level of response demanded by deep maneuver forces each maneuver brigade may require dedicated transportation assets. A transportation company could be assigned to each support battalion. Another option would be to assign an entire transportation battalion to the division but maintain centralized control of its assets. Regardless of the solution, deep maneuver divisions forces will require greater transportation resources than ordinary divisions.

Sustaining

Sustaining the soldiers and their systems includes personnel service support (PSS), health services, field service, quality of life, and general supply support.⁶¹ PSS is the management and execution of personnel services; resource management; finance; chaplaincy activities; command information services; and legal support.⁶² Deep maneuver forces should expect only limited PSS during the conduct of its operations. The bulk of these services can be provided prior to hostilities, during the reconstitution phase

of their missions, and at the conclusion of their missions. During operations, emergency services should receive priority. This does not imply that PSS is unimportant. In fact, it has a tremendous impact on the Quality of Life function. Some services, such as chaplaincy activities, will continue through the conduct of operations.

Health services is the "logistical function of promoting, improving, conserving, or restoring the mental or physical well-being of military personnel."⁶³ One of its major responsibilities is to "ensure that battlefield casualties are treated and evacuated quickly."⁶⁴

The health service system fulfills its responsibilities through four "echelons (levels) of medical care." Echelon I emphasizes stabilization of patients for evacuation to the next level of care. At Echelon II the casualty is examined, his wounds and general status evaluated, and he is treated and returned to duty or his priority for continued evacuation is determined. At Echelon III casualties may receive surgical care from hospital units located in or near the division rear. Echelon IV provides the full range of medical services, staffed and equipped for the most definitive care available.⁶⁵

Echelon III care would present difficulties for deep maneuver forces. The mobile army surgical hospital (MASH) and the combat support hospital (CSH) that provide level III care are corps assets. They are not assigned to the division. One solution would be to give the division an organic surgical capability. This, however, may significantly affect the evacuation policy.

The evacuation policy for deep maneuver forces must be relatively short, because holding large numbers of patients would hamper its mobility. "Short evacuation policies may be established to maintain mobility and accommodate surges of patients."⁶⁶

Therefore, only minor surgeries that do not violate the division evacuation policy should be performed. The policy for deep maneuver forces will of necessity be shorter than the policy for other division.

Deep maneuver forces will also require greater internal evacuation assets to speed the pace of evacuation activities. At a minimum it will require a Medical Company (Helicopter Ambulance). Its mission is the evacuation of patients to and between medical treatment facilities, or to evacuate patients to airfields and airports for further evacuation out of theater. It operates fifteen air ambulances with a maximum single lift capacity of 90 litter patients or 135 ambulatory patients, or some combination thereof.⁶⁷ Depending upon the mission, division medical treatment facilities will retain very few patients. In all likelihood, only patients who can quickly return to duty will remain. Others must rapidly be evacuated out of the division to hospitals within the Communication Zone (COMMZ).

Field services consists of food preparation, water purification, bakery, clothing and light textile repair, laundry and shower, parachute packing, air item maintenance, rigging supplies and equipment for airdrop, and mortuary affairs.⁶⁸ Of all the services, however, mortuary affairs (MA) could be most affected by deep maneuver operations.

MA is perhaps the most important of all field services, as it involves the search, identification, recovery, and evacuation of remains. One of the subprograms of MA is graves registration (GRREG). Unfortunately, current US divisions are *inadequately staffed* to perform effective graves registration functions. There are only four school trained GRREG personnel in the division, one GRREG NCO in the MSB and one GRREG NCO in each FSB. Soon after hostilities begin, divisions receive an

augmentation platoon from corps or echelons above corps. However, "in the initial stages of hostilities before the MSB receives the augmentation platoon, personnel will be pulled from other duties to operate collection points."⁶⁹

This approach would be imprudent for deep maneuver units. Deep maneuver units would require either a permanently assigned GRREG organization or receive augmentation prior to commitment. Once they become detached from other friendly units, there is no assurance that the tactical situation will permit insertion of additional personnel.

Another problem is evacuation of remains outside of the division. The only viable means of casualty evacuation is backhaul of remains by air, and this paper has already addressed the problems associated with heavy reliance on aerial support. Yet, the mission of deep maneuver forces demands almost constant movement. If the force is engaged and sustains even moderate casualties, evacuation of casualties would become a major problem.

Airdrop is another field service that is required at the onset of hostilities, and it could play a significant role in deep operations. It should, however, be used for emergency purposes only. Only limited tonnages can be dropped, thus it should not be depended upon as a primary means of sustaining deep maneuver divisions. Packaged products are ideal items to airdrop, but drops of other supplies and equipment are also possible.

Quality of life issues affect combat motivation, the soldier's will to fight. It is a "command responsibility and involves ensuring effective personnel services, health

services, general supply support, and field services," and care for the soldiers' families.⁷⁰

Commanders of deep maneuver forces must remain particularly attuned to the combat motivation of their soldiers. Soldiers could perceive their mission of fighting in the enemy's back yard as unnecessarily more dangerous than the mission of soldiers in other divisions. Over time and through successive operations, the psychological pressure of their perceived isolation, in conjunction with the stress and strain of combat, could negatively affect their will to fight. Good quality of life programs will help to maintain soldier moral and strengthen combat motivation.

General supply support encompasses the provision of clothing, water, barrier material, and major end items (i.e. tanks and Bradley fighting vehicles) in support of the force.⁷¹ This type of support will be very limited in deep maneuver forces. The major clothing item carried at the DS level will be chemical protective over garments (CPOG). The division must carry large quantities of bottled water, as water sources and production will often be uncertain. Nonetheless the division must maintain reverse osmosis water purification units (ROWPUs) water production capability in the event the tactical situation permits its practical use. Water use should be limited to drinking and medical purposes. Mobile water storage capability is limited primarily to 400 gallon water trailers and 500 gallon blivets. Thus a requirement exists to provide the division with greater bulk water storage vehicles, perhaps 3,500 gallon PLS pods dedicated to water transport.

Other general supplies will also be in short supply at the DS level. Packaged petroleum products, oil, and lubricants will be a unit responsibility. Units will rely on their unit basic loads (UBL) and prescribed load list (PLL) items. DS level units will carry a

limited resupply of clothing, individual equipment, tentage, barrier and construction material, and maps. In short, deep maneuver units will reduce logistical redundancy for many of its general supplies. This will reduce the size of the logistical tail and achieve a leaner logistics organization. DS level units will carry only the most essential general supplies, such as CPOGs.

Regarding major end items, deep maneuver units should expect only minimal replacement operations. Replacement will be limited to command regulated items. One possibility is to use the twenty-four HETs organic to the division transportation motor transport company to haul these items around the battlefield until they are required. As tanks, for example, become uneconomically repairable, a new one could be issued to the losing unit.

These are some, but certainly not all, of the logistical requirements for supporting a division-sized force in the conduct of deep maneuver. Unfortunately, they pose a true paradoxical dilemma for sustaining such a force. On one hand, deep maneuver forces need to minimize the size and length of their logistical tails. On the other hand, most of the requirements, especially in terms of transportation assets, actually point to an increase in the amount of logistic resources. The next section will discuss the conclusions drawn from this logistical analysis of the deep maneuver concept of employment.

V. Conclusions

Effective logistical sustainment of deep maneuver forces is feasible, but only under certain conditions. First, the deep maneuver force should be an *ordinary force*, rather

than an extraordinary force with special support needs and special logistical requirements. In effect, it should reflect more of the former Soviet Union's concept of employment for the OMG. As opposed to using a special force, with a fixed task organization, the theater commander would tailor a force for each deep mission. Support for an extraordinary force is perhaps "a bridge too far."

Second, deep maneuver forces, and all other forces, should *embrace digital technology*. Digitization would enhance the free flow of information and aid the commander in making more timely and accurate decisions. In fact, it could be a serious mistake not to embrace the technology, because digitization may light the path to the future of warfare. Digitized divisions must become ordinary divisions with enhanced capabilities. This should ease some of the logistic and command and control problems caused by digitizing a few select divisions.

The third requirement is to *limit the duration of missions* assigned to deep maneuver forces. Given the requirements for almost total self-sufficiency and 100% mobility, the sheer size of the logistics package begins to counterbalance and even undermine successful accomplishment of the deep maneuver operation. Limiting the duration of the mission will limit the number of DOS that must accompany the force. Unfortunately, this sounds curiously like the "tail is wagging the dog."

Limiting the duration of deep missions will drive changes to the concept of employment. Perhaps deep maneuver forces will perform some but not all of the missions outlined in the MSF and OMG concepts of employment. Maybe its operations will have to focus more narrowly on operations such as raiding enemy supply depots and cutting off

his supply lines. These operations will make the deep force more heavily dependent on the stocks recovered from its raids, as means of resupply. The concept may change from *total* self-sustainability to *limited* self-sustainability and rapid linkup with follow-on forces. The "limited" option is more risky, but it reduces the size of the logistical tail. To facilitate linkup operations, the depth of deep maneuver missions may also change. Instead of conducting operations 300 kilometers deep in enemy territory, the limit of advance must be substantially reduced.

Fourth, and perhaps most importantly, the deep maneuver force structure must include a *logistics commander*. Moreover, all direct support level logistics units and assets within the division must be placed back under the command and control of the support command. Using the Prairie Warrior example, CSB units should have been incorporated into the MSF's support structure. The CSB exclusively and directly supported the division, moved with the division, and took instructions from the division. It might as well have been assigned to the division. The support command would need all of the capabilities offered by the CSB; however, the support could have been coordinated more easily and efficiently from a single command headquarters. A single logistics command will ensure a more integrated and synchronized logistics effort.

This monograph presented some of the major logistical requirements for supporting a division-sized deep maneuver force. This paper was not intended to be a comprehensive document on the subject. Rather, its purpose was to stimulate further thought on the logistical aspect of deep maneuver operations. Due to constraints on the length of the paper, some very important issues such as aircraft maintenance and enemy

prisoners of war evacuation were not discussed. One could write an entire monograph on any one of these topics. Still others were discussed in limited detail. Hopefully, this monograph will add to the growing body of knowledge on support for deep maneuver divisions.

In closing, it is important to remember that people fight wars, not machines. In an article entitled *Land Warfare in the 21st Century*, General Gordon R. Sullivan, the current US Army Chief of Staff, warned that "the nature of war remains constant." This certainly holds true in the logistics arena. No matter how digitized and sophisticated information systems become and no matter how advanced vehicles and equipment become, the requirement for combat service support soldiers to drive trucks, pump gas, rig parachutes, fix vehicles, purify water, and treat and evacuate casualties will always exist. Digitization can improve the efficiency of these processes, but it cannot entirely replace the soldier or the human element of providing tactical logistics. Therefore, as General Sullivan stated, "The artistic side of war will remain: creativity, intuition, leadership, motivation and decision making under conditions of limited information. They will never lose their importance, for they describe war's essence."

Appendix 1: Logistical Enhancements

Several technological innovations logistically enhanced the MSF's capability to conduct sustainment operations. They may prove beneficial not only to the MSF, but to future deep maneuver forces as well. Many of these innovations were inextricably linked to the previously discussed concept of digitization, the MSF's technological "center of gravity." Digitization was the integrative link between all other technologies within the division.

The logistics community is hopeful that these enhancements will eventually lead to the establishment of a "seamless" logistics systems. Seamless logistics implies a "multi-functional system that integrates the logistics community to allow timely and accurate management of the distribution pipeline. The system will have a common automated processing and communications system that is compatible with the needs of the entire user community."⁷²

Two logistical enhancements that will help with the establishment of a seamless system include *total asset visibility* (TAV) and *intransit visibility* (ITV). Specifically, TAV will:

TAV is the ability of the DoD logistics system to gather information about the quantity, location, and condition of assets anywhere in the logistics system at any time and to apply that information to improve logistics processes, such as filling customer orders and improving the handling of shipments or repair pipeline. TAV provides an essential management tool to customers, item managers, weapon system managers and Commanders-in-Chief to move and redirect material, redistribute items rather than buy or repair them.⁷³

ITV is a subset of TAV that will enable logisticians to track items through the distribution pipeline. Together, TAV and ITV will give logisticians the ability to track items across

the entire logistic continuum (strategic, operational, tactical) and maximize the efficiency and effectiveness of the logistics system.

A third enhancement that will benefit from digitization is the ability to conduct *split-based operations*. Split-based operations allow materiel management centers (MMC) to provide centralized management of materiel anywhere on the battlefield. This capability is essential to deep maneuver forces, given the depth of their employment. To do this, part of the MMC remains in CONUS or its peacetime forward-presence location, while the force projection cells deploys to an area of operations (AO) with the force they support.⁷⁴ The forward deployed MMC passes logistics data via electronic transmission to the rear MMC.

Split-based operations could enhance support for the deep maneuver forces in several ways. First, it would significantly reduce the size of the materiel management activity needed to perform centralized management. A much smaller modular cell could now deploy and perform a majority of the same functions as the rear MMC. Secondly, its smaller size and digital linkage to forward units and the rear MMC could improve logistics responsiveness. Ideally, the MMC would base the requirements of the division on near-real-time information. Third, the MMC could follow the force anywhere on the battlefield. Again, the MMC's smaller size would give it greater mobility and the ability to keep pace with rapidly-changing logistical requirements. It would also improve their ability to anticipate future requirements.

A fourth logistical enhancement involves the collection of logistics information. During Prairie Warrior, students experimented with several automated devices that could

improve the timely flow of information. Students on the MSF G-4 staff were introduced to the *battle command decision support system* (BCDSS). BCDSS was a visual aid used to display information concerning unit status. It was designed to support Mission Analysis, COA (course of action) Development, COA Analysis, Decision and Execution. BCDSS's greatest benefit was that it enabled its users to collect and report logistics information on a near-real-time basis. For example, the system enabled battalion and brigade S-4s to update and transmit the status of their units electronically. All players within the division logistics structure were digitally linked and able to access information from a common "server." This eliminated the need for hard copy reports and the need for couriers to deliver the various reports. Consequently, it reduced the number of briefings and paper status reports needed to capture the division's logistics posture.

The system was perhaps most beneficial to the MMC and Division G-4 staffs. It enabled the G4 to quickly assess the division's current logistics posture. The G4 was able to make informed recommendations about COAs under consideration by the division staff or commander. In this way, BCDSS assisted in logistics planning and decision-making. The MMC and G-4 had access to the same information, which enabled both staffs to better anticipate future requirements and to ensure continuity of logistics operations.

On a cautionary note, however, BCDSS was not a panacea designed to meet all of the MSF's digital logistics needs. It displayed tremendous potential and was worthy of further development. However, it was only a reporting system. At battalion and brigade levels, operators still had to input data onto the system. Therefore, the system's value was related to the quality and timeliness of input by its operators.

BCDSS was not the total solution to the sustainment challenges of the MSF or for any deep maneuver force, but it represented a potential enhancement to the reporting of logistics information. Innovations such as BCDSS are indicative of the potential power of digitization. If properly developed and utilized, it could give a deep maneuver force the advantage of being able to logistically respond more rapidly than his enemy. When operating deep in enemy territory, a deep maneuver force needs every possible advantage to successfully carry out its assigned mission. BCDSS showed promise; however, it was not fully developed.

It would be imprudent to discuss digitization without addressing the need for *assured communications*. Assured communications is defined as "the certainty of priority electronic transmission capability when needed throughout the strategic, operational, and tactical areas of operations."⁷⁵ Truly, the digitization concept forms an umbrella over the MSF concept of employment; in many ways it defines the MSF and distinguishes it from ordinary divisions. Assured communications, however, forms the framework, the interconnected undercarriage of that umbrella. Without a strong undercarriage, the umbrella cannot reliably protect its user from the rain. This is equally true for the MSF, as it attempts to minimize the fog and friction created by poor communications on the field of combat. The strength of the digitization concept is only as strong as the assuredness of its communications

The *palletized loading system* (PLS) was a fifth logistical enhancement. The PLS improved mobility and ammunition distribution, which was a major problem with the deep maneuver concept. The PLS was a 16 1/2-ton tactical vehicle consisting of a prime mover

with integral self-load/unload capability, a 16 1/2-ton trailer, and flatracks (demountable cargo beds). It would reduce dedicated personnel, material handling equipment, line haul, and heavy transport vehicle requirements.

Reductions in each of these areas were vital, because high tonnages and handling requirements consumed vast quantities of equipment, transportation, and personnel resources. Deep maneuver divisions such as the MSF must perform the same functions as other divisions, but with fewer resources and with greater efficiency. Therefore, any reduction in resources needed to accomplish a task was indeed meaningful.

The adoption of PLS was a sizable step in the right direction. It was part of the US Army's Maneuver Oriented Ammunition Distribution System (MOADS), which increased the mobility of direct support ammunition supply companies. Under the MOADS concept, ammunition haulers became extremely mobile, and ammunition distribution became considerably more efficient. The new 16 1/2-ton track and trailer were designed for off-road movement, unlike their 22 1/2 ton and 34 ton predecessors. The PLS could now go almost anywhere on the battlefield that the tank could go, resulting in significantly better overall ammunition support. Ammunition distribution would become faster and more responsive. The PLS was without question a welcomed enhancement to the ammunition distribution concept. Eventually, the PLS could also improve distribution of other classes of supply.

These logistical enhancements gave designers of the MSF concept reason for optimism about sustainment of deep maneuver forces. These innovations can breathe new life into the sustainment effort and break the logistical code on support for deep

maneuver forces. They may lessen the strain on what will surely continue to be a heavily taxed logistics structure.

APPENDIX 2: GLOSSARY OF TERMS

ASP - Ammunition Transfer Point	MCO - Movement Control Officer
ATP - Ammunition Supply Point	MCC - Movement Control Center
BCDSS - Battle Command Decision Support System	MHE - Material Handling Equipment
BDAR - Battlefield Damage Assessment and Repair	MMC - Material Management Center
BSA - Brigade Support Area	MSB - Main Support Battalion
COSCOM - Corps Support Command	OMG - Operational Maneuver Group
CSB - Corps Support Battalion	OPCON - Operational Control
CSH - Combat Support Hospital	OPTEMPO - Operational Tempo
DISCOM - Division Support Command	PLL - Prescribed Load List
DS - Direct Support	PSS - Personnel Service Support
DTO - Division Transportation Officer	SOS - Source of Supply
FEBA - Forward Edge of the Battle Area	TAV - Total Asset Visibility
FLOT - Forward Line of Troops	TRADOC - Training and Doctrine Command
FSB - Forward Support Battalion	UBL - Unit Basic Load
GRREG - Graves Registration	UMCP - Unit maintenance Collection
GS - General Support	
HET - Heavy Equipment Transporter	
ITV - Intransit Visibility	
LOC - Lines of Communication	
MA - Mortuary Affairs	
MASH - Mobile Army Surgical Hospital	
MOADS - Maneuver Oriented Ammunition Distribution System	

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